ILRI RESEARCH BRIEF 28
November 2014

Global impact of ILRI's epidemiology expertise: An impact narrative

Did you know?

- ECF, widely prevalent in Kenya, has not been reported in neighbouring Ethiopia; a prediction by ILRI, that parts of the country are, however, highly susceptible to the potential spread of ECF, led the Ethiopian government to establish surveillance on cattle imported from affected countries.
- The total annual losses from heartwater disease in southern Africa were estimated by ILRI in 2000 to be US$47.6 million, of which 61% were production losses and 39% control costs.
- The benefits from effective control of trypanosomiasis in Africa have been estimated at US$700 million per year.
- The Philippines is now free of FMD; ILRI's economic impact assessment of the potential benefits from eradication played an important role in shaping the eradication programme strategy.
- ILRI's report on the research priorities in animal health for poverty reduction shaped ILRI's strategy from 2002-2012 and played a catalysing role in the creation of GALVmed, a not-for-profit public-private partnership that facilitates adoption of livestock health products by poor livestock keepers.

Veterinary epidemiology was first taken up by the International Laboratory on Research on Animal Diseases (ILRAD), ILRI's predecessor, in 1987 and initially focussed on justifying vaccine development for East Coast fever (ECF) and trypanosomiasis. However, responding to the needs of different countries, donors and international organisations, the role progressively evolved into impact assessments of a wide range of diseases, including foot-and-mouth disease (FMD), rinderpest, rabies, Rift Valley fever (RVF) and highly pathogenic avian influenza. As a result of this work, methodologies and approaches have been developed and used all over the world and a cadre of trained epidemiologists are now serving different institutional needs in Europe Africa, Asia, Australia, and Latin America.

Livestock systems in tropical and sub-tropical regions of the world have been plagued by infectious diseases. Such diseases not only impact on livestock but also on farmers' livelihoods, their markets and on food security and safety. In response, ILRI's epidemiology research group initiated pioneering studies on the patterns, causes, and effects of animal health constraints and diseases.

The team has provided vital data and analysis to inform decision-making for improved animal disease control and sustainable livestock development in Africa, Asia and Latin America. In particular, ILRI's integration of epidemiology

with agricultural economics and other social sciences has offered a unique approach for assessing the economic impact of animal disease, and for evaluating the implications of intervention options, whether at farm, national or global level.

Fulani cattle herders from Niger close to the Oti Arm of the Volta River, Ghana.

Gaining a greater understanding of animal disease

Recognised internationally for its work on veterinary epidemiology, ILRAD and ILRI have provided global leadership, research support and capacity building in quantitative epidemiology and economic impact assessment, focussed on developing country needs.

Over the years, an increasing inventory of tools has been developed for effective data gathering, synthesis and analysis to understand the impacts of a wide range of animal diseases including:

- The dynamics and impacts of tick-borne infections of eastern and central Africa
- The dynamics of resistance to trypanocidal drugs in West Africa
- The impacts of FMD control in South East Asia and southern Africa
- The role of research and development networks in rabies control in Africa
- The economic impact of rinderpest control in Africa
- The risks and impacts of RVF in eastern Africa
- The risks of zoonotic and emerging infectious diseases globally

In partnership with national research institutions and veterinary departments, initial research focused on providing in-depth analyses of the transmission and dynamics of tick-borne diseases (ECF and heartwater) in eastern and southern Africa, to determine the risk factors for these diseases and their impacts in the region. For ECF, it was estimated that the cost of the disease in Africa was US$168 million annually, with the benefit-cost ratio of using effective vaccines ranging from 9:1 to 17:1. For heartwater, the economic impact of the disease, and of its control through vaccines, was evaluated and quantified in the countries of the SADC region; 31 million cattle and 28 million small ruminants were found to be at risk to the disease but new inactivated heartwater vaccines were estimated to yield benefit-cost ratios of up to 4.4:1.

Extending the focus

The work was then extended to trypanosomiasis, in particular understanding the emergence and impacts of trypanocidal drug resistance; this contributed to the design of better drug use strategies. In addition, digital databases were developed on the various factors affecting disease and vector distribution and their impacts on society, which assisted in disease control planning in the absence of field-derived data. As a result of this work, the ILRI became an inaugural member of the United Nations Environment Programme/CGIAR partnership for the development and dissemination of digital datasets for research, which still serves the CGIAR centres. Digital interpolated datasets have played a key role in predicting the impacts of climate change and intervention technologies at continental levels, particularly in Africa.

After a decade of work in Africa focusing on ruminant diseases for which vaccines were being developed, epidemiology and impact assessments were applied to rinderpest eradication. As a result, an ILRI benefit-cost analysis revealed that the benefits of the rinderpest campaign in each of the ten countries affected by the disease covered the value of the investment.

> "In setting up the GFRA and placing it on a sound footing in terms of developing as well as developed countries, ILRI provided crucial and globally unique insights and information on FMD epidemiology. Placing FMD control and potential eradication into the economic reality of the poorer nations in the world was something that ILRI was able to do in a way that no-one else understood at the time." Professor Martyn Jeggo, former Director of the Australian Animal Health Laboratory, and GFRA coordinator

At the same time, ILRI's work spread to other continents and included studies on FMD impacts in South East Asia as well as southern Africa. This work improved analytical approaches to impact assessments, which were subsequently applied in South Asia and Latin America. In addition, ILRI provided leadership in the establishment of the Global Foot and Mouth disease Research Alliance (GFRA), under whose auspices ILRI led the development of a Global Roadmap for Improving the Tools to Control FMD in Endemic settings, launched by FAO in 2007 (see box).

Building capacity

An important component of the achievements of the Epidemiology and Disease Control Team, and its predecessors, has been in building capacity in veterinary epidemiology and impact assessment, which has involved the mentoring of numerous masters and doctoral students and post-doctoral fellows in collaborating institutions in Africa, Asia and Latin America.

Since 1988, ILRI has also been closely involved with the International Society for Veterinary Epidemiology and Economics, which resulted in the Society's three-yearly symposium being held in Africa for the first time in 1994. Subsequent meetings brought new levels of recognition to ILRI's epidemiology and animal health economics team and its research; in the 2003 Chile meeting, ILRI had more than 30 papers and posters accepted. According to Professor Roger Morris, inaugural Chairman of the International Society for Veterinary Epidemiology and Economics (ISVEE), "papers to which ILRI staff contributed were prominent at most ISVEE meetings and ILRI's involvement has ensured that there was strong representation at meetings from a range of African countries and organisations, and that developing country papers received adequate emphasis in the program of the various meetings."

Setting a new research agenda

In 2000, at the request of the UK Department for International Development and the Inter-Agency Group of donors supporting livestock research, the ILRI research team provided a milestone study detailing animal health research priorities to address poverty reduction. This study, Investing in Animal Health Research to Alleviate Poverty, is still the most cited reference of disease prioritisation; the methodology has since been further refined by ILRI in 2009 and 2011.

The impact of the initial study on research priorities for development resulted in, for example, the Wellcome Trust launching its programme on Animal Health Research to Alleviate Poverty in July 2002. In this, it set aside £25 million over a period of five years for research to develop methods of predicting and controlling outbreaks of animal diseases. The three "pathways out of poverty" matrix set out in the study also had a substantial impact within ILRI and in setting the agenda for ILRI's institutional research strategy from 2002.

Since 2002, epidemiological capacity at ILRI has been decentralised throughout the Institute and regions and the emphasis on quantitative epidemiology has decreased. The current focus is now on human health issues associated with livestock, in particular the risks associated with food-borne diseases in informal markets, and the risks of new and emerging zoonotic diseases.

A wealth of publications in peer-reviewed journals, strategic reports and policy documents remains the legacy of the veterinary epidemiology and economic impact sciences conducted over the past 25 years.

References

Perry, B.D., Randolph, T.F., McDermott, J.J., Sones, K.R. and Thornton, P.K. 2002. Investing in Animal Health Research to Alleviate Poverty. Nairobi: ILRI. cgspace.cgiar.org/handle/10568/2308

Perry, B.D. and Grace, D. 2009. The impacts of livestock diseases and their control on growth and development processes that are pro-poor. Philosophical Transactions of the Royal Society B, 364: 2643 - 2655.

Perry, B.D., Grace, D., Sones, K.R. 2011. Current drivers and future directions of global livestock disease dynamics. PNAS 110(52): 20871–20877.

Randolph, T.F., Schelling, W., Grace, D., Nicholson, C. F. Leroy, J.L., Cole, D.C., Demment, M.W., Omore, A. Zinsstag, J., and Ruel, M. 200). Role of livestock in human nutrition and health for poverty reduction in developing countries. Journal of Animal Science 85: 2788–2800.

McDermott, J.J. and Coleman, P.G. 2001. Comparing apples and oranges – model-based assessment of different tsetse-transmitted trypanosomiasis control strategies. International Journal of Parasitology 31: 603-609.

Perry, B.D. and Randolph, T.F. 1999. Improving the assessment of the economic impact of parasitic diseases in production animals. Veterinary Parasitology 84: 143-166.

Household pig family in Busia, Kenya

As part of the 'Managing risk in emerging pork markets: A South-South Symposium', held in Hanoi, Vietnam, April 23 - 25 2012, participants visited pig smallholders in Chưng Mỹ, 30km north of Hanoi

Zoonotic emerging infectious disease events (non-wild hosts). Published In report to DFID by Delia Grace et al.: 'Mapping of Poverty and Likely Zoonoses Hotspots', ILRI, 2012

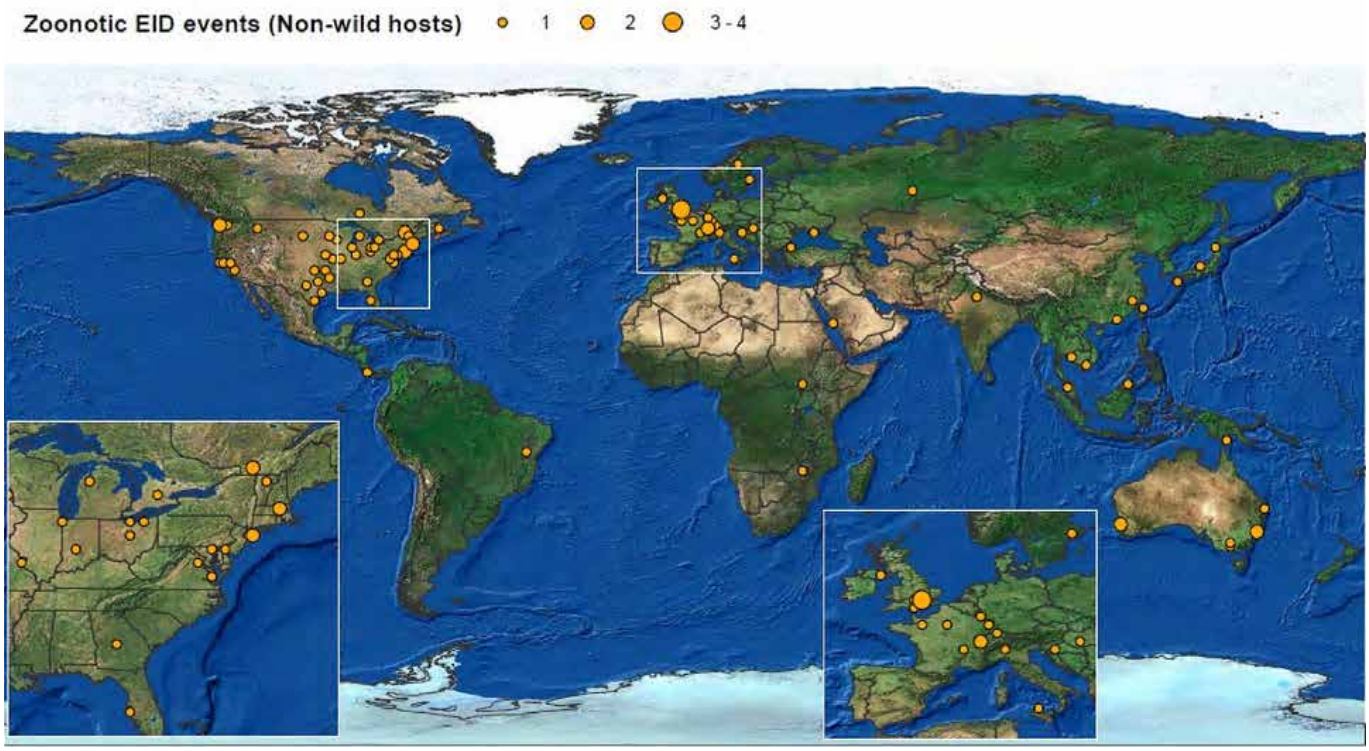

Photo credits:
Page 1: (left) ILRI/Dave Elsworth (right) Lon&Queta
Page 2: John Mauremootoo
Page 3: (top) ILRI/Charlie Pye-Smith (bottom) ILRI/Andrew Nguyen
Page 4: ILRI/Delia Grace

This is one of a series of briefs documenting the impacts of ILRI's research.

It was prepared by WRENmedia with inputs by Brian Perry

Contact

Delia Grace
Program Leader, Food Safety and Zoonoses
ILRI, Kenya
d.grace@cgiar.org

ilri.org
Better lives through livestock
ILRI is a member of the CGIAR Consortium

Box 30709, Nairobi 00100, Kenya
Phone: +254 20 422 3000
Fax: +254 20 422 3001
Email: ILRI-Kenya@cgiar.org

Box 5689, Addis Ababa, Ethiopia
Phone: +251 11 617 2000
Fax: +251 11 617 2001
Email: ILRI-Ethiopia@cgiar.org

November 2014